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PENSOFT

New records of *Acritas bilineatus* Sørensen, 1932 (Arachnida, Opiliones, Cosmetidae) in Venezuela

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Abstract

Acritas bilineatus Sørensen, 1932, is reported for the first time in lowlands (*llanos*) and Andean slopes from Barinas, Táchira, and Yaracuy states in Venezuela, increasing its range extension 350 km southwest from its known distribution. Photographs of habitus, variations of dorsal scutum blots, leg IV armature, and scanning electron microscopy (SEM) of the penis are provided.

Key words

Laniatores, Andean forest; lowlands; new records; SEM.

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Introduction

The Neotropical family Cosmetidae C.L. Koch, 1839 is the second most diverse in the suborder Laniatores, with about 126 genera and 719 species (Kury 2013). *Acritas bilineatus* Sørensen, 1932, the only species of *Acritas* Sørensen, 1932, is hitherto known to inhabit the northern lowlands of Venezuela, in Carabobo and Lara states (Kury 2003). Sørensen, in the posthumous work finished and edited by Henriksen (1932), described this species and offered drawings of the posterior portion of the abdomen, including the anal operculum of some males showing intraspecific variability, a simplified dorsal view of femur IV of the male and the tip of the penis (Henriksen 1932: 325, figs 20–22). Posteriorly, González-Sponga (1992) made a re-description of the species adding drawings of a male, including dorsal habitus, pedipalpus, chelicera, tarsus of leg I, and a lateral view of the tip of the penis (González-Sponga 1992: 3, figs 1–7). In a recent revision of cosmetid material from Venezuela, we found some specimens of *A. bilineatus* that correspond to new records of the species. In this manuscript we present some photographs of the habitus of *A. bilineatus*, different views of leg IV, and complementary SEM photographs of the male penis, showing details overlooked by Henriksen (1932) and González-Sponga (1992). Additionally, a map with the distribution of the species is presented.

Methods

The examined material is deposited in CAULA (Colección de Arácnidos de la Universidad de los Andes, Mérida, Venezuela; curators: Nestor Sanchez and Antonio De Ascenção). Geographic coordinates (in decimal

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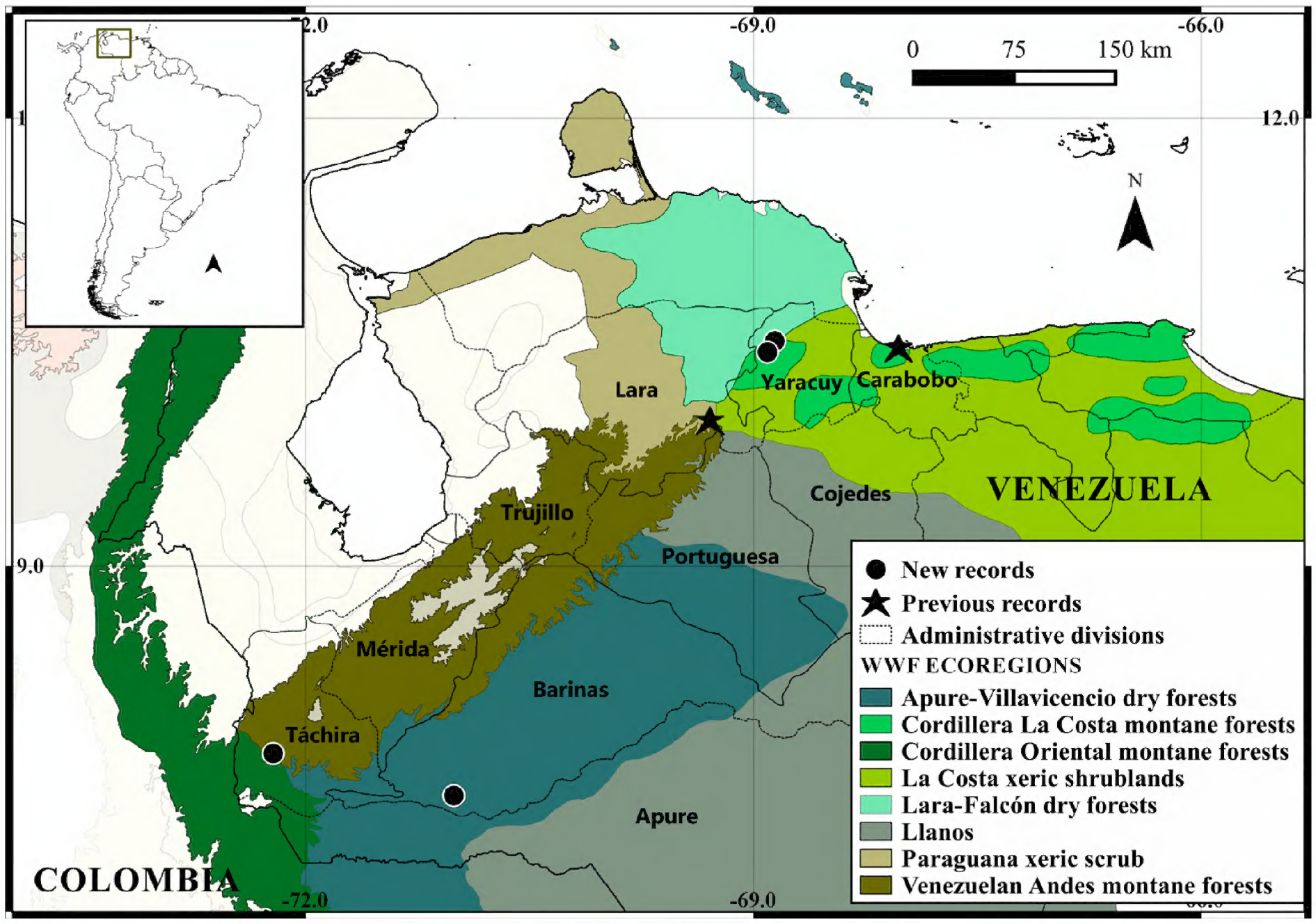

Figure 1. Map showing the distribution of *Acritas bilineatus* in Venezuela. The colored areas represent the WWF (World Wildlife Fund) ecoregions. Dots represent new records and stars represent previous records.

degrees, WGS84) were obtained using Google Maps and placed between square brackets to indicate that they are estimates. The distribution map was made with Quantum GIS 2.2.0 software. Colored shapes refer to WWF Terrestrial Eco-regions of the World (Olson et al. 2001). Scanning electron microscopy (SEM) was carried out with a JEOL JSM-6390LV at the Center for Scanning Electron Microscopy of Museu Nacional-Universidade Federal do Rio de Janeiro (MN-UFRJ, Brazil). Photographs of the specimens were taken using a Sony Cybershot DSC-V1 camera. The multiple images at different focal planes were combined with Combine ZP Suite software (Hadley 2015) and were posteriorly edited in Photoshop CC 2014 software. Color descriptions use the standard names of the 267 Color Centroids of the NBS/IBCC Color System (Jaffer 2017) following Kury (2012). Drawings were made using Inkscape 0.91 software. The morphological terminology follows Kury and Medrano (2016) for dorsal scutum terms; Kury and Villarreal (2015) and Medrano and Kury (2016) for macrosetae; and Kury (2016) for microsetae of male genitalia. Morphometric abbreviations are: AL = maximum abdominal scutum length, AW = maximum abdominal scutum width, CL = carapace length, CW = maximum carapace width, DS = Dorsal Scutum, Fe = femur, MS = macrosetae of penis, ms = microsetae of penis, Pa = patella, Ti = tibia, VP = ventral plate. All measurements are in mm unless otherwise noted.

Results

Order Opiliones Sundevall, 1833
Family Cosmetidae C.L. Koch, 1839
Genus *Acritas* Sørensen, 1932

***Acritas bilineatus* Sørensen, 1932** (Figs 1–5)

Acritas bilineatus Sørensen in Henriksen 1932: 325, figs 20–22; Mello-Leitão 1933c: 113; González-Sponga 1992: 3, figs 1–7; Kury 2003: 37.

Type material. Zoological Museum, University of Copenhagen (ZMUC), 5 males and 2 females syntypes, not examined.

Remarks. The examined material matches with the description given by Sørensen in Henriksen (1932) and González-Sponga (1992), based mainly on: 1) 2 yellow longitudinal lines in dorsal scutum and 2) anal operculum with central spiniform apophysis in males.

New records. VENEZUELA: 1 male (CAULA-Op-0046) from Táchira, San Cristóbal, [7.744611, –72.217227], 2.I.2011, 980 m, Antonio De Ascenção leg.; 1 male (CAULA-Op-0405) from Yaracuy, Bolívar, El Hacha, [10.5072, –68.8575], 300 m, Ivan Mendoza leg; 1 female (CAULA-Op-0406) from Yaracuy, Bolívar, Aroa, quebrada de Curaguire, [10.433058, -68.906596], 4.III.2011, 200 m, Ivan Mendoza leg.; 2 females (CAULA-Op-1882) from Barinas, Esequiel Zamora, Reserva Forestal de Caparo, Cachicamo investigation station (7.4631, –71.0074),

Figure 2. *Acritas bilinetaus* (CAULA-Op-0405), male habitus. **A, B.** Dorsal view. **C.** Ventral view. **D.** Lateral view. **E.** Posterior view. Scale bars = 1mm.

8–9.II.2017, 150 m, in leaf litter, Nestor Sanchez leg. 2 males, 2 juveniles (CAULA-Op-1887), same data as CAULA-Op-1882. **Previous records.** VENEZUELA: [3 males, 11 females, and 3 subadults] from Lara, Palavecino, Parque Nacional Terepaima, [9.9719, –69.2919], [11.xii.1980], 1200 m [Miguel von Dangel and Manuel Ángel González-Sponga leg.]. **Type locality.** VENEZUELA: [5 males and 2 females] from Carabobo, Puerto Cabello, San Esteban, [10.4576, –68.0289], [iii.1888] 120 m. (Fig. 1).

Distribution and habitat. *Acritas bilineatus* is distributed in dry and montane forests of lowlands (eastern plains called *llanos*), Andean slopes from Barinas, Lara and Táchira and lowlands of Yaracuy and Carabobo states in the La Costa Range in Venezuela (Fig. 1). This species was collected in a wide variety of microhabits such as

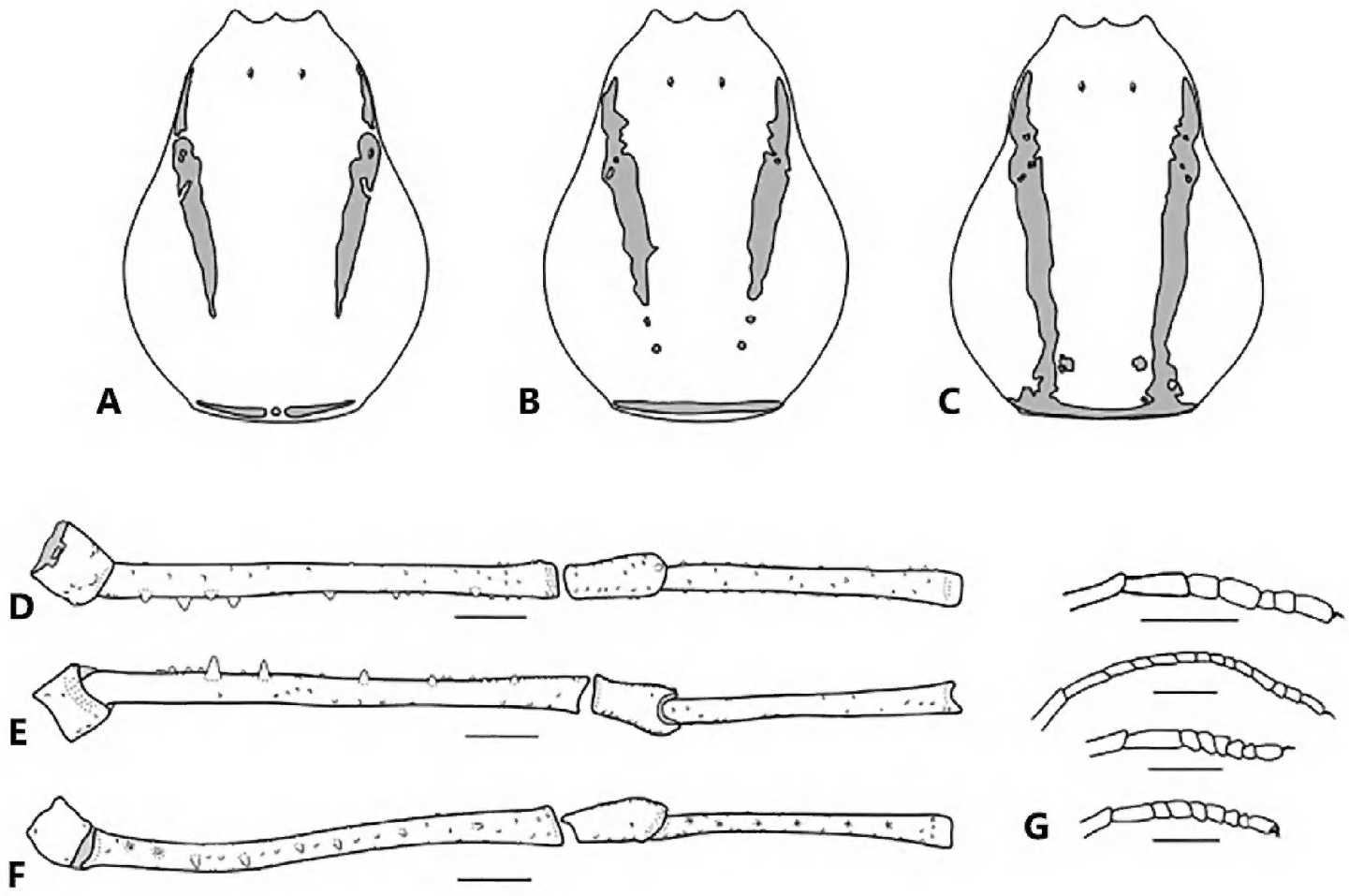

Figure 3. *Acritas bilineatus*. **A–C.** Variations of *dorsal scutum* blots: **A.** From Barinas (CAULA-Op-1882). **B.** From Barinas (CAULA-Op-1887). **C.** From Táchira (CAULA-Op-0405). **D–F.** Male leg IV (trochanter to tibia) (CAULA-Op-0405): **D.** Dorsal view. **E.** Ventral view. **F.** Retrolateral view. **G.** Tarsomeres I-IV. Scale bars = 1mm.

soil, rotten trunks, under rocks, and decomposing plant material, in peri-urban and woody relict areas affected by human activity (Lara, Táchira and Yaracuy states), and in well-preserved environments in the town of Barinas (Barinas State), and individuals were collected in natural and synantropic habitats. At night, an individual was observed feeding on the litter of ripe fruits of *Ficus* sp. (Moraceae).

Complementary description. Male (CAULA-Op-0405): Body (Figs 2A–E, 3A–C). Measurements: AL = 3.2 mm, AW = 3.8 mm, CL = 1.5 mm, CW = 2.1 mm. DS beta (β) shape, smooth (Figs 2A, B, 3A), with 2 yellow longitudinal lines (similar to braces) beginning at ozopores level, sometimes reaching the posterior border of DS (Figs 2A, 3A–C). Carapace smooth, ocularium low without median depression, slightly granulate (Fig. 2D). Lateral margins of DS with few granules (Figs 2A, 2D). Posterior border of scutum sub-straight and with a row of tubercles and free tergites I–III with a row of tubercles (Fig. 2E). Anal operculum with a curved row of tubercles and a robust central spiniform apophysis (Figs 2C, 2E, 5A). **Legs.** Measurements: Fe I = 3.3 mm, Fe II = 7.1 mm, Fe III = 5.0 mm, Fe IV = 6.0 mm, Pa I = 0.6 mm, Pa II = 1.1 mm, Pa III = 1.1 mm, Pa IV = 1.2 mm, Ti I = 2.0 mm, Ti II = 6.0 mm, Ti III = 2.8 mm, Ti IV = 4.0 mm. Legs I–IV increasing in thickness gradually (Figs 2A, B). Coxae I-III slightly granulate, coxa IV slightly granulate with a robust anterolateral *clavi inguines* (Figs 2A, 2C, D). Legs I–III unarmed, straight (Fig. 2A). Leg IV dorsally and ventrally with some tubercles from trochanter to tibia (Fig. 3D, E). Femur IV curved in retrolateral view, with a row of 8 separated tubercles, the 2 basal lower than third and fourth, the others decreasing in size distally (Fig. 3F). Tibia IV in retrolateral view with a row of 6 tubercles (Fig. 3F). Tarsi I–II with 1 smooth claw; tarsi III–IV with 2 subparallel smooth claws and tarsal process (Fig. 3G). Tarsal counts: 6(3)–6(3)/13(3)–11(3)/7–7/8-8 (other examined specimens have the number of tarsomeres in leg II ranging from 11–14). **Color** (in ethanol). Carapace Deep Brown (56). Blots in carapace Light Yellow (86). Pedipalpus, chelicerae and legs I–IV Moderate Brown (58). Abdominal sternites Deep Reddish Brown (41). **Male genitalia** (Fig. 4). VP of penis subrectangular with concave distal border; VP with 2 apical MS C curved and laterally inserted; 2 MS D, the most distal (D1) large and straight following the same lateral row as MS C and the other (D2) smaller, inserted dorso-laterally on the mid third of VP (Fig. 4A, B, D); 2 MS A straight and laterally inserted, near to D2 (Fig. 4B); VP with 2 lateral, elongated, dense patches of type 4 microsetae (Fig. 4C) but separated by a longitudinal space (Fig. 4B); 2 small MS E volcano-shaped in the ventral face (Fig. 4B); 1 small MS B volcano-shaped inserted laterally in the base of the VP (Fig. 4D). Glans mostly smooth; stylus long falciform, tip with wattle barbels, without process (Fig. 4A, B).

Sexual dimorphism. Male chelicerae not hypertelic. Females differ from males by having slender armature in leg IV, posterior margin of DS wider, and by lacking a tubercle in anal operculum (Fig. 5). We did not detect differences in size of this tubercle among the collected males.

Discussion

The previously known records of *Acritas bilineatus* suggest a distribution restricted to the northern Caribbean

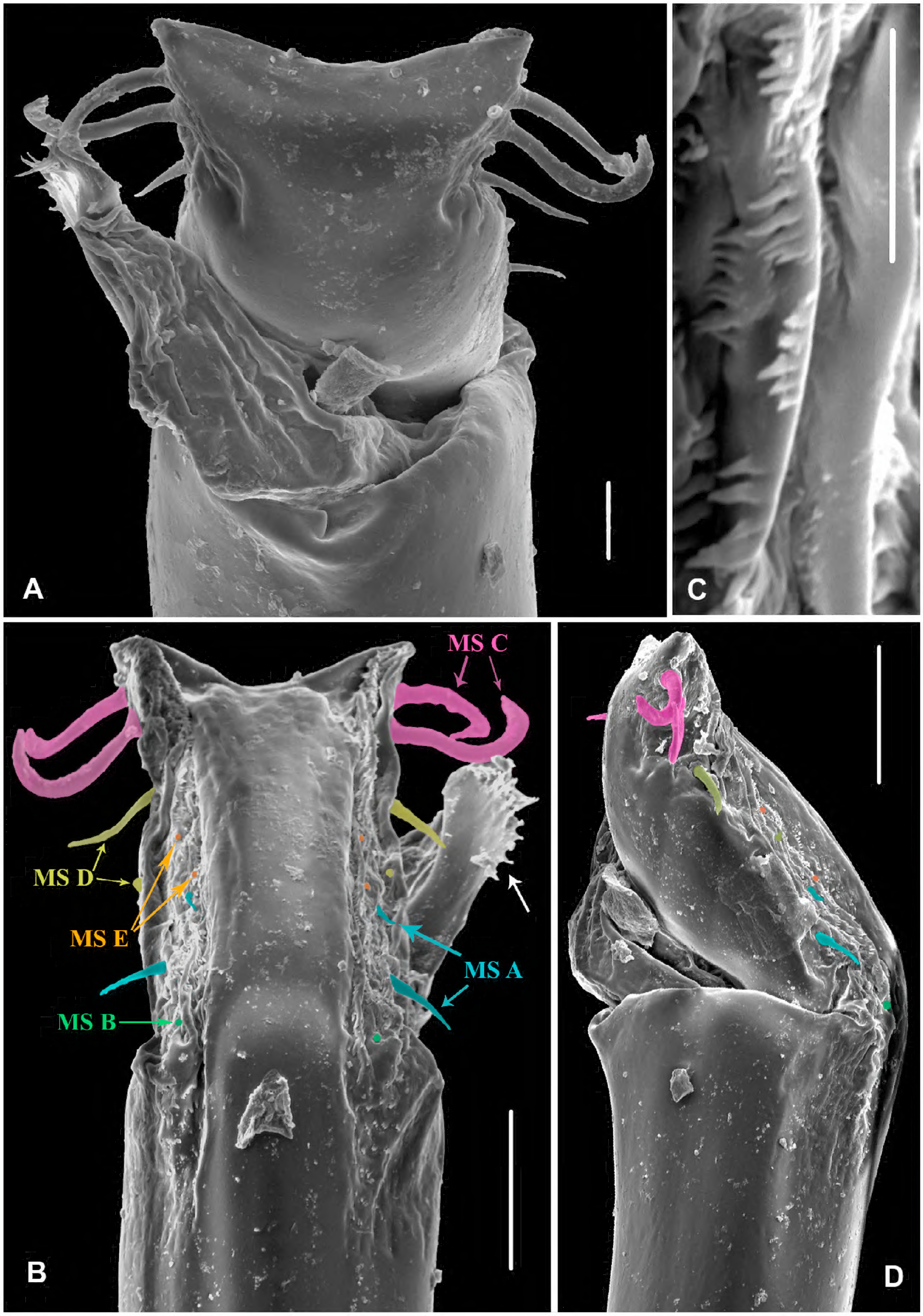

Figure 4. *Acritas bilineatus* (CAULA-Op-0405). Male penis: **A.** Dorsal view. **B.** Ventral view (white arrow indicates wattle of stylus apex). **C.** Detail of type 4 microsetae of ventral plate. **D.** Lateral view. Scale bars: A = 20 µm; B, D = 50 µm; C = 10 µm. Colors: MS C (fucsia), MS D (yellow), MS A (light blue), MS B (green), MS E (orange).

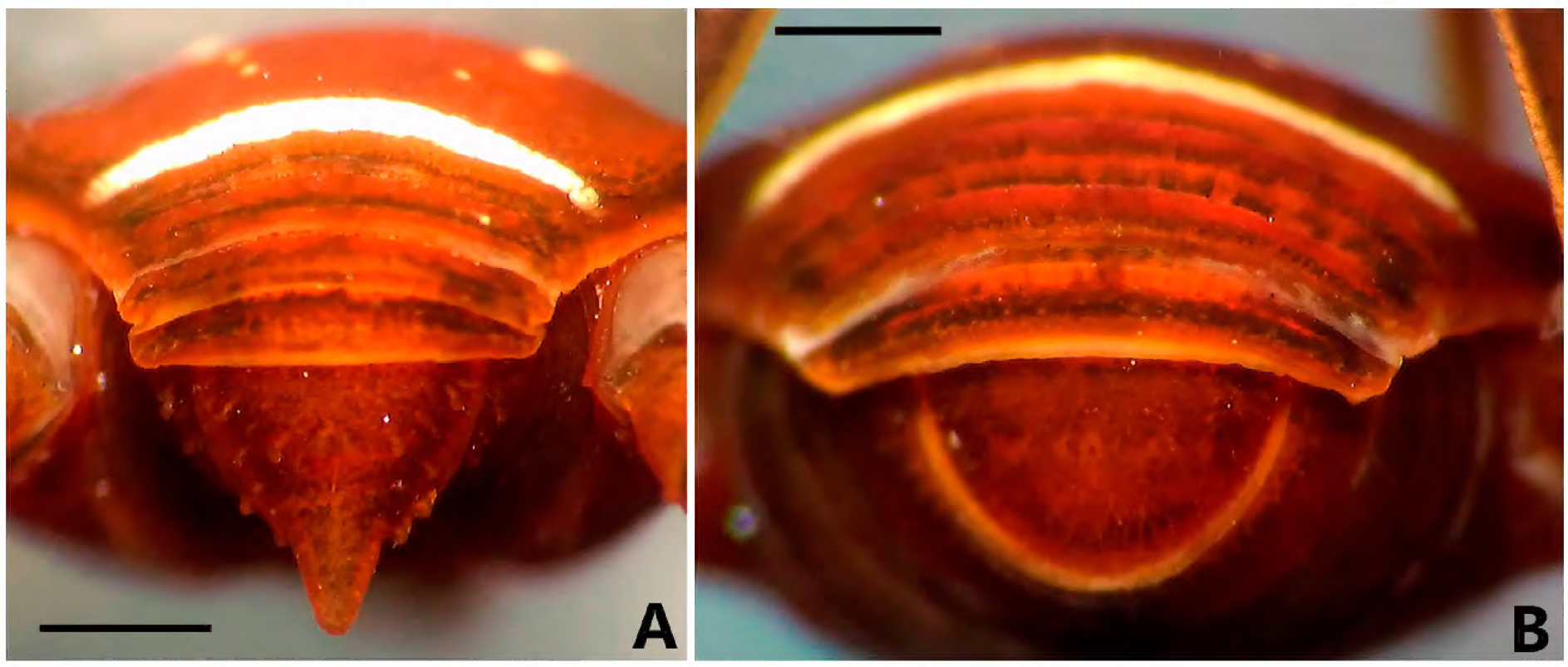

Figure 5. Sexual dimorphic anal operculum in *Acritas bilineatus*: **A.** Male (CAULA-Op-1882). **B.** Female (CAULA-Op-1887). Scale bar = 1mm.

coast on the southern slopes of La Costa Range (including the Sierra de Aroa) and northern slopes of the Andes of Venezuela, from 200 to 1200 m above sea level (a.s.l.) (Kury 2003). However, the new records show that this species occupies several ecoregions in its range including montane forests of the La Costa and Andes ridges (Cordillera La Costa montane forests ecoregion, Venezuelan Andes montane forests, and Cordillera Oriental montane forests) and dry forests of the Llanos plain (Apure-Villavicencio dry forests), indicating a widespread distribution in Venezuela (Fig. 1).

The widespread distribution of selected species of harvestmen has been addressed in some recent works, but only from Argentina (Acosta and Vergara 2013 for *Gryne orensis* (Sørensen, 1879); Vergara and Acosta 2015 for *Discocyrtus dilatatus* Sørensen, 1884). Both works show 2 interesting patterns: 1) overlapping distribution areas of 2 harvestmen species belonging to different families and 2) disjunct areas with the same species. In the case of *A. bilineatus*, González-Sponga (1992) thought that the type locality of the species (San Esteban, Carabobo State), as stated by Sørensen in Henriksen (1932), is questionable and could be result of wrong label data because he made expeditions to the type locality and was unable to obtain specimens from this area. However, we have recorded individuals of this species in the Yaracuy State, 75 km west of San Esteban, in the same ecoregion (Fig. 1). So, we do not question the type locality until new expeditions to this area are done.

The localities where *A. bilineatus* is recorded for the first time display climatic characteristics (24–27 °C and 1300-2400 mm of precipitation) and vegetation related with semideciduous forests or premontane forests sharing similar characteristics, influenced by the trade winds in much of its extension, which occupy the area near the Andean piedmont, beginning at the eastern base of the Andean Cordillera in the states Apure, Táchira, Barinas, and continuing in a west-east direction to the region of contact with the piedmont of the Cordillera de la Costa, near San Carlos, Cojedes State. This vegetation formed a large jungle spot of about 500 km long by 60 km wide, defining a large dry forest unit, which has now lost 80% of its area as a result of deforestation and establishment of agricultural activities (which even extend to the southwest in Colombia, Departments of Meta and Casanare) (Guevara et al. 2011). This mosaic of vegetation (typical grass plains and montane and dry forests mixed) supports the presence of the species in Barinas and Táchira states, 350 km at southwest of the type locality, close to the border with Colombia (Fig. 1).

Additionally, the occurrence of this species is linked to the presence of forests with these characteristics because they represent a biological and biogeographic corridor between the bioregions associated to the Caribbean and those related to the lower portions of the Andes and forests of Amazonian influence (Guevara et al. 2011). On the other hand, this species is able to exploit environments at higher elevation, being found in rain forests up to 1200 m in height as pointed out by González-Sponga (1992). In fact, the wide altitude range of *A. bilineatus* seems not to be uncommon between harvestmen. Medrano and Kury (2017: fig. 33) showed that the cosmetid *Eulibitia scalaris* (Sørensen in Henriksen, 1932) is distributed in 3 different ecoregions in Colombia, encompassing altitude ranges between 1584 to 3000 m a.s.l. (Medrano and Kury 2017: 41). In Venezuela this situation is also evidenced in the cosmetid *Cynortula venezuelensis* Roewer, 1915, whose distribution in the state Merida (Venezuela) covers an altitudinal range between 1500 and 3000 m a.s.l. (unpublished data).

Acritas bilineatus was found in sympatry with other species of harvestmen of the genus *Cynorta* Koch, 1839 (Cosmetidae), *Stygnus* Perty, 1833 (Stygnidae), and some specimens of Manaosbiidae and Sclerosomatidae (Gagrellinae). These accompanying species were recorded in all the new localities reported in this study, indicating that they follow the same pattern of wide distribution described for *A. bilineatus* and constituting

other evidence that breaks down the marked endemism of the species of Venezuelan harvestmen postulated by González-Sponga (1992).

Intraspecific variation of DS blots pattern are common in cosmetids from the same locality or from different localities (e.g. Kury and Barros 2014, Medrano and Kury 2017) and *A. bilineatus* is not the exception. The 2 yellow longitudinal blots of the DS exhibit variation between specimens, always beginning at the ozopores level but sometimes ending at the area III level (from Barinas) or reaching the posterior border of DS and fusing to the posterior blot (from Táchira) (Fig. 3A).

Finally, the SEM images of the penis show the stylus apex with a wattle and the type 4 ms distributed at lateral margins of the VP (Fig. 4), as seen in *Taito* (Kury and Barros 2014) and *Platymessa* (Medrano and Kury 2016), characteristics considered informative for taxonomy of Gonyleptoidea (Kury and Villarreal 2015, Kury 2016) and that were not showed in the descriptions/drawings of Sørensen in Henriksen, 1932 and González-Sponga (1992). We hope that this information will be useful for further research in cosmetid systematics.

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Authors' Contributions

AFG made the map, took the photographs, edited the SEM images, and drafted the final version of the text; NSG and ADN identified the species, collected some specimens, took some photographs, and performed the complementary description.

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